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ROSES for
the HOME



INTEREST IN ROSES is so widespread that, in temperate regions, there is seldom a garden or dooryard without its rosebush.

Roses are adapted to various purposes, such as plantings on lawns and borders, arbors and trellises, cut flowers, bedding, hedges, ground covers, and tree roses.

Cultivated roses range from recently introduced species, that are hardy and largely disease resistant, to hybrids that are the results of generations of crossings and require much attention to details of cultivation, feeding, pruning, and spraying.

Roses may be grown in any good, moisture-retaining soil that is well drained. Sandy soils are not so good as clay soils and require more frequent applications of fertilizer. Roses respond readily to rich feeding. Cow manure is the best fertilizer for them, but other organic fertilizers may be successfully used.

As a rule, roses require severe pruning, but it must be adapted to the purpose for which the roses are being grown. They require protection in most parts of the United States and grow best when given clean cultivation, without other plants among them.

Careful and frequent spraying is necessary for most kinds of roses. Poison sprays should be used for biting insects, contact sprays for sucking insects, and fungicides to prevent disease infections.

ROSES FOR THE HOME

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THE ROSE probably has been cultivated as long as any ornamental plant and holds a warmer place in the hearts of the people than does any other flower. It has figured in the literature of all ages and all nations. Its name is practically the same in all languages. It is loved by poor and rich alike for its beauty of form and color and for its delicious fragrance. It is grown in the dooryards of the least pretentious cottages, whose occupants may be stinted in food and raiment, as well as on the grounds of large estates where abound the choicest things that money can buy. It is grown in immense quantities under glass and is the most popular winter cut flower.

Wild roses abound in great variety over practically all the temperate regions. Man has appropriated the most pleasing wild forms, and in addition has so modified and improved them by breeding and selection that now there are roses for many special purposes. The growing of these roses for ornamental purposes is discussed in this bulletin.

GENERAL CULTURE

SOILS

Roses thrive in fertile, well-drained garden soils of types that range from heavy clay loams to light sandy loams and that are either slightly acid or neutral. They can not be successfully grown in poorly drained soil or in that which is very acid or very alkaline. Clay loam soils that are retentive of moisture, but from which an excess of moisture drains promptly, are probably suited to more kinds of roses than any other soil type, although some of the cut-

flower roses thrive on both clay loam and sandy loam soils, and a few rose species are found growing wild on sandy land as well as on loamy soils.

Deep, rich soils are best. Topsoil 18 inches deep has possibilities of better results than shallower soils, although many excellent roses are grown on only 10 inches of topsoil over a well-drained subsoil. Where the soil is shallow it is sometimes desirable to excavate some of the subsoil in order to provide a deeper bed of good soil. Such extra depth must be adequately drained, as such excavations in a clay subsoil often form cisterns.

If soil is not naturally well drained, artificial drainage must be provided, for roses will not grow well in soil on which water stands. This drainage is sometimes provided by tile or stone drains. Ditches for such drains usually are 3 feet deep and 12 to 20 feet apart, depending upon the tenacity of the soil.

Often it is simplest to obtain 4-inch drain tiles and lay them in the ditch, but where stones are abundant the ditches may be filled with them to a depth of 12 or 18 inches and the stones covered with straw or inverted sods, and soil. Whether tiles or stones are used for the drains, the outlets must provide free egress for water.

FERTILIZERS AND CULTIVATION

Roses respond to deep, thorough preparation of the soil, with an abundance of fertility. A good application of manure plowed or spaded under in the original preparation of the soil will give excellent results on soils that are in sufficiently good tilth for a garden or for good field culture. Cow manure is the best for roses. Mixed farmyard manures are good, but fresh horse manure is the least desirable of the animal manures. Composted manures are also excellent; well-composted leaves, straw, and other organic material is only slightly less valuable. Where these materials are not available, stockyard cattle and sheep manures may be used, or such organic fertilizers as dried blood, tankage, fish scrap, cottonseed meal, and ground bone.

In using manure or compost, an application 2 or 3 inches thick, or more, is desirable. Stockyard manures and organic fertilizers may be used at a rate of as much as 1 pound to 10 square feet of ground, or one-half pound per rosebush. Ground bone and mixed commercial fertilizers with an analysis of 5-10-5¹ or richer can often be used at the rate of 1 pound per 80 square feet of ground or less, as a supplement to the other materials mentioned. Usually the applications of such fertilizers in the amounts recommended should be repeated annually. Sandy soils need heavier and more frequent applications of organic manures than do heavier soils.

Roses require clean cultivation or well mulched soil.

PLANTING

The same care must be used in planting roses as in planting other woody plants.² The roses must be dug carefully to prevent mutila-

¹ Percentages of nitrogen, phosphoric acid, and potash, respectively.

² For further information on this subject consult Farmers' Bulletin 1591, *Transplanting Trees and Shrubs*.

tion of their root systems, the roots must be kept moist until the plants are reset, the holes in which they are planted must be large enough to permit the roots to be spread in a natural position, neither fresh manure nor commercial fertilizers must be placed in direct contact with the roots, the roots must be well spread, with fertile and friable soil between them, the soil must not be too wet and must be thoroughly compacted about the roots.

Usually dormant plants are set, although sometimes plants grown in pots are preferred. The most suitable plants to be selected are discussed in other sections of this bulletin.

The time of planting roses differs with the kind of plants, the location, and somewhat with the season. In sections where the temperature seldom falls below 10° F., where the winter winds are not exceptionally drying, and where the soil has been so prepared that it does not heave badly, dormant roses are best planted in the fall.

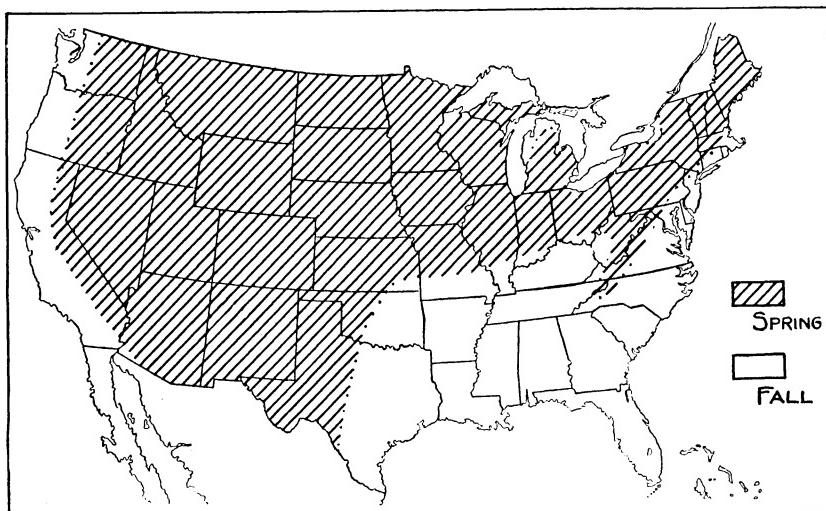


FIGURE 1.—Outline map of the United States, showing the regions in which fall planting and spring planting, respectively, are usually most satisfactory

In most other places spring planting is best. The different regions are indicated on the map shown in Figure 1. North of the line suggested as the division between successful fall and spring planting there are localities where fall planting can safely and satisfactorily be done. South of this line there are localities where spring planting is more desirable.

Roses planted in the fall will usually grow much better the first season than those planted the following spring. Fall planting is best done as soon as the leaves have fallen from most trees and bushes. Spring planting should be done as early as the ground is dry enough to work, or when it springs apart after being squeezed in the hand.

If spring planting must be delayed until after roses have started into growth, plants growing in pots are desirable. They should be set out only after maples come into leaf, or not more than two weeks before oaks come into leaf.

Responsible nurserymen handle and pack their plants so as to retain moisture and thus prevent the roots from drying and the tops from shriveling, so that they reach the buyer in good condition for growth.

Roses should be planted as soon as possible after they are received. If they can not be planted immediately, the plants should be unpacked and heeled in, that is, the roots laid in a trench and covered with soil so that all are in close contact with it. The tops of dormant plants usually are laid close to the ground in heeling in, although this is not essential. If the plant roots are dry when received, soaking them in water an hour or more before heeling them in is desirable. If the stems are shriveled, burying the whole plants for a few days may restore plumpness and insure their growing. If the plants are frozen when received, they should be placed where they will thaw gradually, but they should not be unpacked until the frost is out beyond all question.

When ready to be set, the plants should be taken to the permanent location with the roots thoroughly covered, no matter how short the distance. More plants are killed by excessive exposure of roots at planting time than by any other cause. The roots may be placed in a bucket of water while being removed to the planting ground, or puddled in a mixture of thin clay and then kept covered with wet burlap or other protection until planted, making sure that the clay does not dry out before planting.

The roses should be planted a little deeper than they were originally. If planted too shallow, the roots probably will be exposed and will dry at the exposed portions. This will prevent the passage of sap from the covered tips of the roots to the branches. Too-shallow planting may cause a lack of firm anchorage, in which case wind will sway the plant, loosening it in the soil so that the roots will dry and die.

If planted too deep the bark of the buried stems will be injured, and growth will be checked until new roots form nearer the surface. The proper depth for planting is shown in Figure 2.

In planting dormant rose bushes it is desirable to trim the ends of broken roots just before they are put into the holes, so that there will be good, smooth, fresh surfaces which can callus and heal over. It is usual to leave this fresh-cut surface on the underside of the root. The hole in which the bush is to be planted should be several inches larger across than the roots will extend and ample in depth, with a little loose earth on the bottom. The roots should be separated well, extending in all directions, with the soil well worked in among them, and should be arranged in layers, the roots in each layer being spread out like the fingers of the hand. When the hole is partly full of earth, the plant should be shaken up and down to make sure that it is in close contact with the soil under the crown where the roots branch. When the roots are well covered, the soil should be firmed. This is best done by tramping it. If the soil is in proper condition tramping can not injure the plants. It will leave a depression about them, but all the roots will be covered.

When potted plants are used and are in pots of a size suited to them, the ball of earth containing a plant may be removed from a pot, the drainage—broken crockery or gravel placed in the bottom

of the pot—removed, and the ball planted intact, with its top one-half inch below the level of the ground. The earth must be firmed securely about the ball.

If large plants have been put in small pots and their roots badly twisted, it is usually best to straighten these roots somewhat even if it breaks their contact with the earth in the ball. There should be the least possible disturbance of the roots, as breaking their contact with the soil tends to offset the advantages of potting the plants. If the roots are loosened from the soil the top of the bush will wilt. In such cases the plant should be well shaded and often will need much pruning.

The plants may be watered after being planted, although this is not usually necessary, especially if the roots have been puddled before being planted. If water is applied it should be allowed to soak in about the roots, and the hole should then be filled with dry

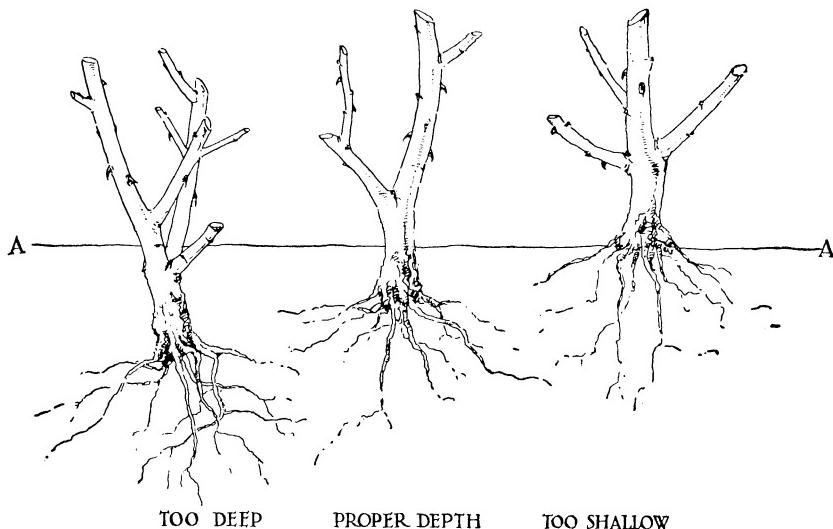


FIGURE 2.—Proper and improper depths for planting rose bushes. The line A—A indicates the surface of the soil

earth without more tramping. If the plant is not watered the depression should be filled with loose earth the same as if it had been watered. After being planted, the roses should not be watered unless very dry weather follows, and even then care must be taken not to water too heavily until after growth starts. When watering it is desirable to draw some earth away from the bush, apply the water, and, after it has soaked in, draw dry earth about the plant again. (Fig. 3.) Potted roses are watered in the same way as dormant plants.

PRUNING

One-half to two-thirds of the wood should be removed from rosebushes when they are planted. Weak branches should be taken off, and long canes likely to whip around and loosen the plant should be cut back. So far as practicable, other pruning should be accom-

plished by cutting out whole branches rather than by cutting off the ends. Potted plants set without the ball of earth being broken should require no pruning.

Pruning that is to be done after the planting season depends so much on the type of rose and the purpose for which it is being grown that further discussion of pruning will be included under the various types of roses.

PROTECTION

Many roses need protection. Most are much more successful if protected from wind both winter and summer, although in humid climates it is well to insure a free circulation of air about them in summer. Earth is the best protecting material. Evergreen boughs, deciduous brush, and straw and burlap about the plants each serve

a purpose. Occasionally, in attempting to grow certain varieties far beyond the normal region of their successful cultivation, it is necessary to protect the plants with leaves or straw and then to protect the leaves and straw from snow and rain. Methods of protection will be discussed in more detail in the sections on the different types of roses to which they particularly apply.

DIFFICULTIES AND ENEMIES

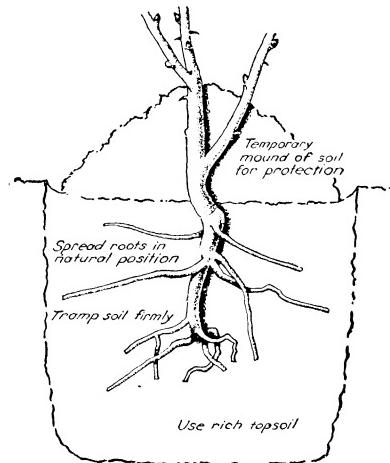


FIGURE 3.—A newly set plant with the roots well arranged, with the top well pruned, and a mound of earth properly drawn up about it. Roses planted in the fall in regions where there is freezing weather or strong drying winter winds require such protective mounds

and diseases than are good healthy plants kept in a vigorously growing state. Timely waterings and judicious applications of stimulants in summer help to avoid many troubles. On the other hand, overstimulation is undesirable. Some difficulties are the direct result of poor culture, with no disease or insect responsible; others, though caused by outside attack, may be more or less mitigated by vigorous growth.

In addition to good culture, protection from insects and diseases is required by many kinds of roses. This protection consists of timely spraying to control four principal types of pests—sucking insects, biting insects, diseases affecting the leaves, and diseases affecting the stems. Even more practical than identifying the specific insect or disease attacking the rosebush is persistently applying three types of material—poison on the leaves to guard against chewing insects, fungicides on leaves and stems to prevent the entrance

of diseases, and contact insecticides applied when sucking insects are found.

SPRAYING AND DUSTING EQUIPMENT

Effective application of remedies for control of insects and diseases requires that the materials be applied to all parts of the plant without unnecessary time and labor. This is best done either by the use of a fine spray applied until the foliage is wet but not so wet that the liquid collects in drops, or else by the use of a dusting appliance that will thoroughly cover both sides of the foliage.

For the rose garden of average size, containing up to 50 plants, a sprayer of the compressed-air type, holding 3 to 5 gallons, satisfactorily fulfills the ordinary requirements and is inexpensive and durable. The pressure is applied by a hand pump requiring only periodic operation, the can is carried on a shoulder sling or by a good handle, and the spray is readily applied to either side of the leaves through a rubber hose terminating in a metal handle with a control valve and an angle nozzle. For larger rose gardens a wheel-barrow-type sprayer holding 12 to 15 gallons, provided with a brass spray pump and a mechanical agitator, is preferable. For only a few rosebushes the plunger type of hand sprayer, holding 1 quart, represents the minimum investment. Whatever type of sprayer is used, the nozzle should emit a fine mist and cover the widest possible area. A sprayer that delivers a stream of coarse drops is wasteful and ineffective.

Dusting appliances to meet different requirements are available. The best general-purpose dusters for the small flower garden, useful also in the vegetable garden, are of the crank or the bellows types, holding about 5 pounds of dust. For a small number of plants the hand-plunger type of duster is effective, although rather wasteful of dust. Like the quart-size hand sprayer, it represents about the minimum of equipment for effective control of rose pests and diseases if control efforts are to be commensurate with expenditure of time and money for plants and in ordinary cultural operations.

INSECTS³

Insects attack the rose in three different ways. Some feed externally on the foliage and flowers, eating the tissue of the plant; some bore in the stems and bark; and some suck juices from the bark, leaves, and new growth.

Evidence that the leaf and flower eating insects are present consists of chafed or skeletonized leaves or of holes eaten in leaves, petals, or buds. The insects usually responsible for this type of work are sawfly larvae, often called "rose slugs," and caterpillars. The method of control usually employed against them, and one which is very satisfactory, consists in spraying or dusting the plants with some mixture containing lead arsenate. Sometimes one application of this poison is sufficient, but occasionally more are necessary.

The following mixtures of lead arsenate are suggested: For spraying, 3 teaspoonfuls of lead arsenate, 1 or 2 ounces of soap, and 1 gallon of water. For dusting, 1 ounce of lead arsenate,

³ Prepared by William Middleton, entomologist, Division of Fruit and Shade Tree Insects, Bureau of Entomology.

4½ ounces of lime (hydrated or air-slaked), and 4 ounces of superfine sulphur. In both formulas thorough mixing of the materials is highly important.

The time for applying the spray or dust is also very important, and the treatment will be most effective if it is made promptly and thoroughly when the insects or their fresh feeding work are first observed.

Caution.—Lead arsenate is a dangerous poison. It should be handled carefully and kept where it can not be obtained by children and where it will not be mistaken for anything used in food or as medicine. The material may injure delicately-colored flowers that are sprayed or dusted with it.

In addition to the caterpillars and slugs that eat the foliage and flowers, some adult beetles also feed on these portions of rose plants. The same methods of control may be used for these insects, but are generally not quite so effective against adult beetles. For this reason, and especially against the rose chafer, hand picking and crushing the beetles or knocking them from the flowers into a vessel of water covered by a film of kerosene is recommended in addition to spraying or dusting.

The borers of roses are of two general types, those that only enter the pruned ends of shoots through the large, soft pith and those that attack and bore in unpruned shoots. The methods of control for the two differ slightly. In both types of injury it is important to cut off infested shoots below the work of the borer and to destroy such shoots. It would be a good plan, while doing this, to examine other plants in the neighborhood for similar work and treat these at the same time. Furthermore, in the case of the pruned-shoot borer, the ends of all large-pithed plants should be protected from further work by shoving the point of a tack down into the pith so that the head protects the open or pruned end.

A number of different sucking pests feed on roses, and their methods of attack and their control differ so much that only the most general discussion is possible here. The usual types of sucking pests are: Spider mites, which feed chiefly on the foliage; thrips, which are generally within the flowers between the petals; aphids, or plant lice, found on the leaves, buds, and new growth; and scales, which usually infest the canes.

Against the spider mites, thrips, and aphids, a nicotine-sulphate spray will usually be most satisfactory. The spray must be applied at least twice with an interval of from 7 to 10 days between applications. The formula for the nicotine-sulphate spray is: Nicotine sulphate, 1 to 2 teaspoonfuls; soap (fish-oil preferred), 1 to 4 ounces; water, 1 gallon. The treatment should start as soon as the pests are observed, and the material should be sprayed in such a manner that it will wet the bodies of the pests. In the case of both spider mites and thrips, a clean rose garden or planting, free from weeds, is of great importance.

The following procedure will usually control scale insects: (1) Remove all infested plant material that can be spared. (2) Spray thoroughly in the early spring, just before new growth starts, with one of the lubricating-oil emulsions, miscible oils, or lime-sulphur. Use such material according to the manufacturer's directions. Do not

let the oil sprays accumulate on the ground about the bases of the plants where they may injure the roots, and do not let the lime-sulphur spray get on painted objects.

Most rose insects are community problems, and the entire neighborhood should cooperate in fighting them, each individual at least taking care of his own place.

For further information on insects, communicate with the Bureau of Entomology, United States Department of Agriculture, sending specimens carefully packed and a description of the trouble.

DISEASES⁴

In the following paragraphs is given a brief description of the most common rose diseases, with recommendations for control; but for a more comprehensive treatment of this subject the reader is referred to Farmers' Bulletin 1547, Rose Diseases: Their Causes and Control.

Two fungous enemies of roses, those responsible for mildew and black spot, are to be found wherever roses are grown, and some form of protection against them is essential in every rose garden. To an appreciable extent this protection may be obtained by selecting in each locality, varieties that suffer only a minimum of injury from these diseases. The adaptation of varieties is so variable in different localities that no infallible list showing the susceptibility or resistance to these troubles can be made, but certain general rules can be stated. Roses not adapted to the climatic conditions where they are grown are especially subject to black spot; this applies to hybrid perpetuals and hybrid teas when grown in the South. Rugosas and Wichuraianas are characteristically resistant to this disease. The hardy climbers, as a class, especially the varieties Crimson Rambler and Dorothy Perkins, are subject to mildew, as are also the Killarneys and Gruss an Teplitz among the hybrid teas.

Mildew.—Blisterlike areas on the young leaves and grayish-white patches on the older ones mark the first appearance of mildew. On young shoots it may cause swellings or marked distortion. Under high humidity the infected areas are covered with a conspicuous whitish mold consisting of the vegetative system and reproductive bodies or spores of the fungus. The spores are thoroughly disseminated by rain and air currents, and find lodgment and appropriate conditions under which to germinate and start new infections when the foliage is frequently covered with dew. The disease may spread to all parts of a plant or to neighboring plants within a few days after its first appearance. Besides distorting and sometimes killing the tips of young shoots and blighting the flower buds, the disease cripples a considerable part of the foliage and may cause the leaves to fall. Late in the season the patches of white mold take on a dirty-gray color, and minute spherical black bodies may be seen embedded in them. These bodies are the resting-spore stage of the fungus, which enables it to survive the winter on persistent or fallen leaves and in infected bud-scales, flower stems, and seed vessels.

The disease usually becomes serious only as the growing season wanes, but the rambler roses may be attacked in full bud, especially

⁴ Contributed by Freeman Weiss, pathologist, Division of Horticultural Crops and Diseases, Bureau of Plant Industry.

if they have not been properly pruned and trained to permit adequate air circulation through the foliage.

Mildew attacks of bush roses can be almost entirely prevented by the application of a sulphur dust as often as the removal of the dust coating by rain or the exposure of unprotected foliage by new growth requires. This is especially true if the roses are planted in a border or a garden with good air circulation on all sides. The sulphur dust preferred for this purpose is ground fine enough for the particles to pass through a screen of 300 meshes to the inch. A mixture of 9 parts of sulphur to 1 of powdered arsenate of lead is generally used. One form of prepared sulphur dust is dyed green so that it is scarcely perceptible when applied to foliage. The lead arsenate is used not only to poison leaf-eating insects but to promote the ease of application of the sulphur. The latter may be used alone, but ordinary flowers of sulphur is not suitable for dusting. The dust can be applied with a hand dust gun of the plunger type. However, dusting devices equipped with fans or bellows are more rapid and easier to manipulate and are to be preferred, if the size of the rose garden justifies the additional cost. The best distribution of the dust is secured if it is applied when the air is still and the foliage is dry, as in the early evening before dew has fallen.

Since the mildew fungus may survive on blighted shoots, the removal of spent flowers immediately after the flowering season, and a general pruning for climbing roses, or a light trimming to remove all dead or weak branches in bush roses, as recommended in the sections on rose culture, will prove helpful in combating mildew. However, it is extremely difficult to completely control mildew in the highly susceptible rambler roses, especially when they are trained against a wall where the circulation of air is obstructed and the application of fungicides is more or less precluded.

Black spot.—So widespread and prevalent is black spot that it hardly requires description, and the name itself characterizes the principal symptom. The spots, typically present on the upper surface of leaves, but sometimes developing on young twigs as well, are black and have a characteristic irregular margin with narrow lobes and indentations. The size of the spots may nearly equal the width of the leaves, or there may be many small ones that coalesce. The characteristic effect of the disease is to cause premature yellowing and dropping of the leaves, so that after a severe attack plants may be nearly defoliated in midsummer. The constant effort of the plant to replace the fallen leaves with new shoots greatly depletes its vitality, besides leaving the growing tips in a soft and immature condition at the beginning of winter. As a result, rosebushes that are severely injured by black spot are especially liable to winter injury. The disease is very persistent and insidious, running a course from early spring until the fall frosts. It is much less prevalent in dry seasons, but quickly reappears during intervals of wet weather. Black spot is most likely to attack plants that are low in vitality because of lack of climatic adaptation, starvation, or unbalanced fertilization. As in the case of mildew, the fungus that causes this disease survives through winter in fallen leaves and in infected shoots. As defoliation is more or less continuous all summer, persistent attention to keeping the ground free of fallen leaves is

necessary; or, with only a few roses, infected leaves may be hand picked. It is especially important to clean the bushes of infected leaves and to clean the beds of fallen ones in the late fall. In the event of a severe attack of black spot, the plants may be lightly trimmed in the fall to remove infected branches and, of course, the usual cutting back before growth is resumed in the spring should be done, with special attention to removing diseased parts.

The application of a dormant lime-sulphur spray is sometimes advisable. Commercial lime-sulphur should be used in a dilution of 1 to 12 with water, and the application may be made any time before the buds swell in the spring.

With the resumption of leaf growth, black-spot control will require a milder fungicide than lime-sulphur, although the customary dilution for summer spraying—1 part of commercial lime-sulphur to 50 parts of water to which 1 per cent ferrous sulphate is added—may be used if there is no objection to spray-stained foliage. As a substitute for this spray, Bordeaux mixture may be used. Commercial forms of Bordeaux mixture are available, or it may be prepared at home from copper sulphate (bluestone) and hydrated lime. The bluestone is dissolved in water at the rate of 1 pound to 1 gallon, and the hydrated lime is separately mixed with water at the rate of 1½ pounds to 10 gallons. The bluestone solution is then poured into the limewater and thoroughly stirred. To improve the spreading and adhesive power of the spray, a commercial spreading agent may be added, or 1 pound of ordinary white flour, first made into a thin, smooth paste with warm water, may be added to the 11 gallons of spray resulting from the above formula. Bordeaux mixture must be used soon after the ingredients are mixed, but the bluestone solution and limewater may be preserved indefinitely in separate covered vessels. The bluestone solution should not be stored in a metal vessel, because it will corrode the vessel and thus ruin the solution for spraying purposes.

Bordeaux mixture, like lime-sulphur, stains the foliage, and in garden roses this may be very objectionable. Fortunately, the sulphur-lead arsenate dust specified for mildew control is just as effective as Bordeaux mixture in the control of black spot and is nearly as efficient in preventing canker. Because black spot is present throughout the season, more persistent applications are required than would be necessary to keep mildew alone in check, but this is not ordinarily a serious objection because in a home garden of average size the roses can be dusted in a fraction of an hour, and with the sulphur-dust mixture (which can be bought at plant stores) on hand, there is no preliminary bother in mixing sprays. It is especially important to continue the dust treatment during the latter part of the growing season, when atmospheric conditions are particularly favorable for infection and the vitality of rose plants is low.

Brown canker.—Brown canker is less widely distributed than mildew or black spot, but it is prevalent in the Eastern States. In many rose gardens it is possibly the most destructive disease, because of the injury it causes in the principal branches, often girdling and killing entire canes. The name brown canker is derived from the characteristic cinnamon-brown color of the large cankers that develop in the spring from infections that started the preceding summer.

These cankers, especially when they occur low on large canes, may be of considerable size, sometimes several inches long and encircling the cane. Smaller cankers occur on the branches, especially near leaf scars, and on the flowering stems. The cankers typically bear numerous small black fruiting bodies of the causal fungus. These are formed beneath the outer layer of bark, but project through it. They are tiny vessels filled with spores. In the late winter resting spores are produced, but during the summer another type of spore is produced in enormous numbers. These are widely disseminated, especially by rain, and are capable of infecting young tissues in any part of the plant, including stems, leaves, buds, and flowers. Affected buds or flowers are crippled and discolored. The infections on leaves and young shoots cause the appearance of small purplish spots, usually with a dark border. Late in the season the centers of these spots become grayish white, but the spots do not increase in size until the next spring, when they rapidly enlarge and the color deepens to that of the typical brown-canker stage.

What has already been said about a light pruning in the fall to remove the smaller diseased branches, followed by heavier cutting back in the late winter before the buds swell, applies equally to the control of brown canker. Heavy pruning in the fall is usually inadvisable, because if the weather continues warm the pruning may force buds into growth; but removal of diseased branches is always timely. In the spring the plant can be formed to better advantage, and the effects of the winter and the progress of the canker infections can be seen more readily. In pruning out diseased parts the aim should always be to cut well below the canker into white, clean wood.

A dormant spraying with lime-sulphur in December is one means of combating brown canker, but during the growing season Bordeaux mixture, as described under black-spot control, should be substituted for lime-sulphur. In the home garden, dusting with sulphur-arsenate dust will usually be preferred for the sake of the appearance of the foliage, but in wet seasons when it is almost impossible to preserve the dust coating on the leaves, appearances may well be sacrificed in favor of the superior protection given by sprays.

Other diseases.—Other diseases to which roses are sometimes subject include rust, various cankers, crown gall, root knot, and several types of leaf spots. Some of these are rare, but even those of more frequent occurrence are usually amenable to the methods of disease prevention and control already described.

In the event that a rose appears persistently diseased or becomes badly crippled by some infection, such as brown canker, it will generally prove a saving in time and money to root it out and start anew with a healthy plant.

PROPAGATION⁵

From the standpoint of propagation roses may be considered in two groups—those that will reproduce from seeds, with only trifling variations, and those which do not come true from seed and therefore must be propagated vegetatively, that is, from a piece of stem

⁵ For a more complete discussion of propagation consult Farmers' Bulletin 1567, Propagation of Trees and Shrubs.

with one or more buds or eyes. Most of the rose species are grown from seed because this is usually the simplest way and there is usually so little variation of a species that the seedlings are practically all like the parent. Seedlings from hybrid roses and from flowers that have been artificially crossed vary greatly and are grown in the hope of securing new and better varieties. Seeds usually germinate best if planted as soon as they are ripe or if, when freed from the pulp of the hips, they are stored with alternate layers of moist sand (stratified) until spring when they should be planted early.

Roses may be propagated vegetatively in various ways, and various kinds of roses differ in the ease with which they may be propagated by different methods. The methods themselves differ in the quantity of material they require to produce a given number of plants and the method of propagating any rose will depend upon its adaptation to the kind of rose, and upon the amount of propagating material available.

Some roses produce stems that run underground, throwing up new growth at frequent intervals. This is called "suckering." These underground stems can be dug up and cut into pieces, each having a bud. These pieces can be planted and each rooted piece having a live bud will make a new rosebush. Other rosebushes grow stems on the surface of the ground and these stems take root from many of their buds. These rooted stems may be cut in pieces, and each rooted piece that contains a live bud will make a new plant. Stems are sometimes pegged to the ground for this purpose, or covered at intervals with soil. Propagation in these ways is called "layering."

Budding and grafting are frequently used methods of propagating roses. They involve growing a top of one kind of rose on the root of another kind. The top is called the "scion" and the root is called the "stock." In budding, a single bud of the scion, with some of the surrounding bark, is inserted under the bark of the stock. In grafting, a portion of the stem of the scion with one or more eyes is fitted to the stock in such a way that the growing layers of both are in contact. There are several methods of grafting, each of which has its name.

Propagation may also be by cuttings of immature wood, called "greenwood" cuttings, or of mature wood, called "hardwood" cuttings. Some home gardeners grow their own roses from plants they have seen and admired in their neighbors' gardens or elsewhere.

Greenwood cuttings are taken whenever wood has begun to harden and has become firm. The base of a flowering shoot after the flower has fully opened is an example of wood in good condition for a greenwood cutting; wood, equally mature, but from a nonflowering shoot, is also suitable. Often several cuttings can be made from one stem. A piece from 3 to 6 inches long, with three buds, makes a cutting of a good length. The cuts should be made with a sharp, thin-bladed knife, close below the lower bud and any distance above the upper bud. (Fig. 4.) The lower leaves are usually removed and the leaf at the top left on, but all the leaflets except two are cut away to reduce the amount of leaf surface exposed to the air.

When the cuttings are made they should be dropped into water or wrapped in moist paper for protection until they are planted. They should be planted without delay, in sand or light loamy soil, in small holes or a narrow trench in which they are set about an inch apart and deep enough so that the top bud and leaves just protrude from the soil. The sand must be thoroughly packed around them, particularly at their lower ends. They should be thoroughly watered immediately after being planted, and inclosed to keep the leaves from wilting because of excessive evaporation through them before the development of roots enough to supply the plants with moisture. A coldframe or a spent hotbed is a suitable place for rose cuttings if the glass is shaded or if a cheesecloth-covered frame is used in place of the sash. In handling only a few cuttings many persons successfully invert fruit jars or glass dishes over them. (Fig. 5.)

As the cuttings begin to absorb moisture, a little air should be admitted to prevent the growth of mold and fungi. In frames,

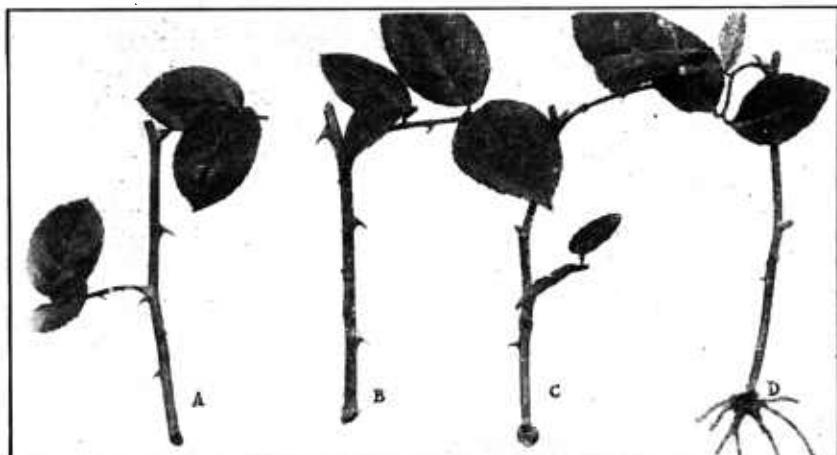


FIGURE 4.—Rose cuttings: A, When first made; B, partly callused; C, callused; D, roots started

frequent spraying is needed, but under jars it is not necessary, since the moisture is prevented from escaping. When roots have formed freely the plants should be transplanted to good soil, watered well, and shaded from the midday sun for a few days. Subsequent watering should be moderate until the plants are well established. These young plants need special care and attention, because at this stage they are extremely tender. If they have been started in soil and are not overcrowded it is often well to leave them until the following spring before moving them, but ordinarily they must be transplanted, and careful shading and watering are then essential. If the plants are started in midsummer it may be well to plant them in a frame where they may be protected by sash and mulch until the following spring. If they are started in late summer it may be better to leave them under the jars with some litter, to prevent alternate freezing and thawing and to shade them partly until settled weather in the spring.

For hardwood cuttings, good, strong, well-ripened shoots of the previous summer's growth should be selected. They are better if cut after the wood matures but before freezing weather. If they are left until cold weather there is danger that they will be injured by freezing. They should be cut into pieces 4 to 6 inches long, with the lower cut just below a bud, and should be planted in sand beds with jars placed over them, as described for greenwood cuttings, or in frames, if the frames can be spared during the busy spring season when these cuttings will be rooting.

If the cuttings are not to be planted until the following spring they may be tied in bundles with raffia or with string that will not rot easily when exposed to dampness, plainly labeled, buried in a box of moist sand and placed in a cool cellar or buried with the tops down in the open ground below danger of frost. They should be planted in the open ground early in spring, deep enough so that one eye or not over 1 inch of the cutting is above the ground. This will leave 4 or 5 inches of the cutting in the ground. Care must be taken not to injure the calluses that have formed while the cuttings were buried. Sometimes better results are obtained by planting the cuttings in partial shade rather than in full sunlight.



FIGURE 5.—Rooting rose cuttings under inverted fruit jars. These jars may be used to cover either greenwood or hardwood cuttings

ROSES FOR THE LAWN AND BORDERS

Roses for the lawn and border are those which have foliage and habits of growth as well suited for relief planting about the ground line of buildings, in masses upon the lawn, or along borders, as have other ornamental shrubs. Suitable sorts of roses are quite as appropriate and effective in mixed groups as are other shrubs. To be suitable, however, they must be hardy, moderately free in growth, and possess foliage reasonably resistant to disease and free from insect attack. In fact, for this purpose, foliage is more to be desired than fine flowers for it is important during the whole growing season, while the flowers may last less than a fortnight.

In Figure 6 the groups on the borders of the grounds or about the base of the house might appropriately be composed in part of these hardy roses, while cut-flower roses should be grown in the garden.

These are the only roses that can be grown in much of the Rocky Mountain region and the country immediately east and west of it.

SUITABLE SPECIES AND VARIETIES

Rugosa rose.—The Rugosa or Wrinkled Japanese rose (*Rosa rugosa*) is one of the deservedly popular sorts for landscape planting. The original form, native to China, Chosen (Korea), and

Japan, grows 5 to 6 feet tall, is rose colored, single, with rough, dark foliage. It blooms nearly all summer, and bears large bright-red hips that persist during the winter. This rose is hardy in the North, succeeds well in the South, and thrives within reach of ocean spray. There is a good white form. (Fig. 7.) Hybrids are being introduced that are more or less double and of several colors, from pure white to deep rose. Some of the hybrids are less prolific than the type in the number of hips formed.

Carolina rose.—The Carolina rose (*Rosa carolina*) is an upright shrub, native from Canada to the Gulf of Mexico and west to the Mississippi River; most common in moist places. It reaches a height of 8 feet and has dull-green foliage and small pink flowers in flat-topped clusters, followed by small bright-colored hips.

Rosa lucida.—The wild rose (*Rosa lucida*), native in New England, New York, and Pennsylvania, even on sandy land near the coast, is a shrub growing 6 feet tall, with dark, shiny leaves. Its single pink flowers are borne singly or in small clusters in June and July. The hips are small and bright red. The stems are brownish red, showy, and attractive. When planted closely it is especially desirable for

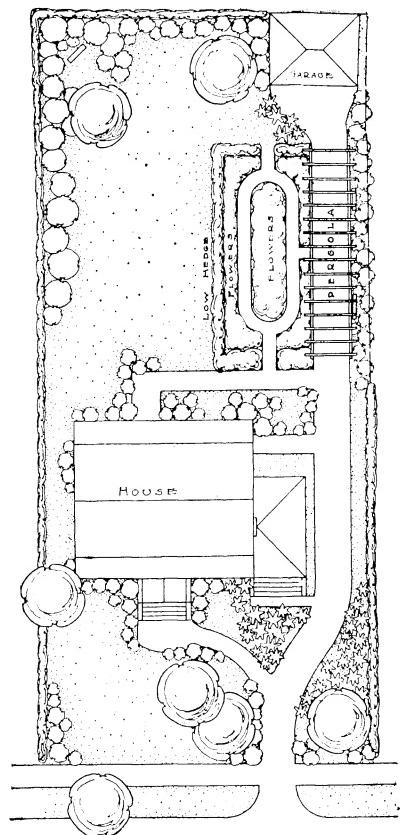


FIGURE 6.—Plan for a city lot. Border roses may be used in combination with other shrubs in any of the clumps about the house or along the borders. Cut-flower roses would be appropriate in the garden.

a low ground cover 2 to 3 feet high. It effectively deters crossecutting and is good for rough banks and seaside planting or other adverse conditions.

Prairie rose.—The Prairie rose (*Rosa setigera*) is a shrub 6 feet high, with long, drooping branches that adapt it for use as a pillar rose also. Native from Canada to Florida and west to Wisconsin, Nebraska, and Texas, it is hardy and thrives under adverse conditions. Its flowers are scentless, single, deep rose, in several-flowered clusters, fading to almost white. The hips are bright red, showy,

attractive, and persistent. This is one of the parents of some of the first American climbing roses.

Arkansas rose.—The Arkansas rose (*Rosa arkansana*), formerly included with *R. blanda*, is a valuable species, native from Minnesota and British Columbia to Mexico. Its flowers are single, pink, sometimes white, in clusters. It is useful for covering dry slopes and barren places. This rose is not widely listed by nurserymen, but is a valuable sort for the dry regions in the western half of the country and for other dry soils.

Sweetbrier.—The sweetbrier or eglantine (*Rosa rubiginosa*) is an upright, compact shrub from Europe that has run wild in many places. A characteristic spicy, aromatic odor is emitted by the young shoots in damp weather and from the leaves when bruised. The flowers are single, pink, one to three in a cluster; the hip is either orange or scarlet, and the foliage is bright and glossy. There are many good crosses, among them the Penzance hybrids.

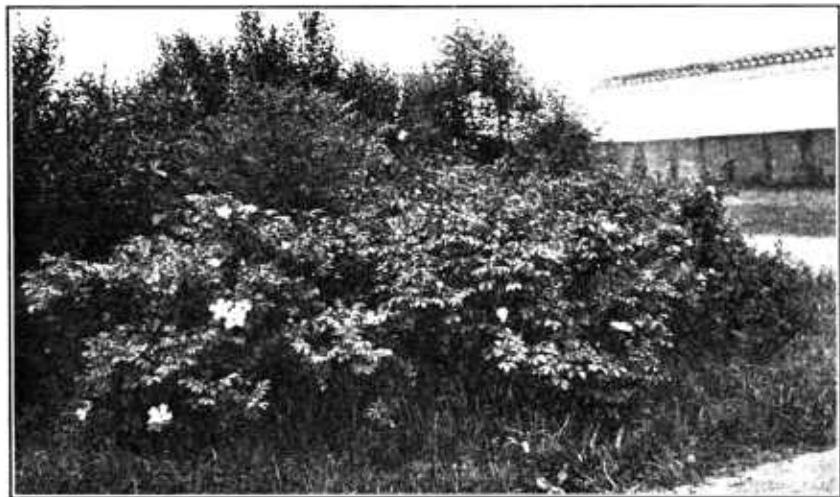


FIGURE 7.—*Rosa rugosa alba* in full bloom in a clump of shrubbery. Other shrubs in the background. These roses bloom all summer, and the blooms are followed by very attractive hips.

Rosa eglanteria or R. lutea.—The Austrian Copper, Austrian Yellow, Persian Yellow, and Harison's Yellow are important and useful varieties in the *R. eglanteria* or *R. lutea* groups. They are deep yellow, showy, with green or greenish winter stems. The Pernetiana roses are closely allied to these.

Cabbage rose.—The Cabbage rose (*Rosa gallica centifolia*) is a shrub attaining a height of 5 feet which has only one blooming season, but that is a long one. The flowers are double, either red or white. The variegated Provence rose is closely related. There are also cultivated forms with mossy calyxes, some with red flowers and some with white. There are other moss roses derived from hybrid perpetuals which are not adapted to the same uses as Cabbage roses.

Damask rose.—The Damask rose (*Rosa damascena*) is a round, compact, 5-foot shrub that holds its foliage late and bears two crops of red flowers.

Hugonis rose.—The Hugonis rose (*Rosa hugonis*) is a comparatively recent introduction valuable for its abundant bright-yellow flowers in very early spring, its many arching stems, bright red on the younger parts, bright-red hips and its fine airy foliage. It grows to a height of about 6 feet and is very hardy.

Additional species.—In addition to the foregoing, and perhaps equally desirable, are long lists of valuable species offered by nurserymen, among which are *Rosa xanthina*, *R. sericea*, *R. spinosissima altaica*, and *R. ccae*. Each year sees more species added to this list.

PLANTING

The distance at which to plant roses in masses, whether in clumps or in border plantings, will depend on the variety and also on the other plants used. Plants in such locations should be so spaced that when they reach maturity they will come together without overcrowding. Those of the Rugosa and the Austrian Copper groups should be given 3 feet of room, and the hybrid Rugosas and other kinds, 4, 5, or 6 feet, depending on the vigor of growth of the variety.

The varieties most used in landscape planting are usually priced by nurserymen according to size, rather than age, that is, according to height and, to a certain extent, according to stockiness or weight. A short, stocky, or heavy plant is better than a taller, light one. The roses used as a substitute for other shrubbery are so hardy that they should be treated as other shrubs in their respective localities are treated.

PRUNING

After the first year, pruning should consist of removing dead, dying, or weak wood, branches that cross, and branches with discolored pith. The ends of branches should not be cut off. Many of the roses suggested for border planting are improved by having the whole top cut off every five or six years, but usually it is best to cut the oldest canes clear to the ground every two or three years. Pruning these roses in the summer or fall would remove the hips prematurely and thus rob the plants of much of their winter attractiveness.

PROTECTION AND CULTURE

Such roses need winter protection only under extremely trying conditions. In the dry plains area, if the autumn has been dry, a good mulching after a thorough soaking of the soil should be given the first winter. The roses should be kept cultivated for two or three years. After this, if the fallen leaves are allowed to remain under the plants they will constitute a mulch sufficient to discourage weeds. It may be desirable to add a little mulch until a good cover is established. After two or three years fertilizer should be applied to these shrubs only when there appears to be a weakening of the growth.

SPRAYING

Only occasionally do these roses need spraying. When the need is discovered they should be given the required treatment immediately.

PROPAGATION

All of these roses may be propagated from seed, and many may also be propagated in other ways, especially from suckers, as well as from hardwood cuttings, by layering, budding, and grafting.

ROSES FOR THE ARBOR AND TRELLIS

Climbing roses are used for covering pillars (fig. 8), porches, arbors, pergolas, summerhouses, walls, fences, and banks. Those that do not grow more than 6 to 8 feet high are spoken of as pillar roses, while the more vigorous ones are called climbers or ramblers, depending somewhat upon their parentage. With a few exceptions these roses have but one period of bloom, which lasts one, or at most two weeks. The foliage provides the ornamental effect for the remainder of the season; therefore a rose with healthy, vigorous foliage, not subject to disease or insect attacks, is desirable. A healthy rose is especially attractive on or close to a house. Where shade is desired throughout the summer, other climbers are preferable to roses because of the severe pruning which the roses require in early summer. Roses are not climbing plants in the same sense as grapevines or morning-glories. They have no tendrils and do not support themselves by twining. Therefore it is necessary to train and tie the canes as they grow.

SPECIES AND VARIETIES

The varieties of climbing roses belong to several groups, with many intermediate kinds. Multiflora roses, usually spoken of as hardy climbers, or ramblers, are reasonably hardy as far north as Nebraska, Ohio, central Pennsylvania, and southern New England. They flower in clusters and are vigorous growers, although many are subject to mildew and to insect attack.

The Wichuraiana or Memorial rose has small, dark, glossy, almost evergreen foliage, resistant to disease and insects. Its blossoms are single and white, followed by bright hips. Many hybrids have been introduced; most of them retain the desirable foliage characteristics of the parent while differing greatly in their blossoms. Bright hips, which persist through the winter, follow the blossoms on the single varieties if the bushes are not pruned.



FIGURE 8.—A young climbing rose (Clotilde Souperf)

The climbing tea roses are pillar roses and retain some of the tea-rose habits, blooming more or less continuously throughout the season.

Roses of the climbing Noisette group, represented by Maréchal Niel, Lamarque, and other varieties, are suitable for culture only where the winter temperature seldom falls to 10° F.

Roses of the Laevigata group, represented by the Cherokee, require as warm a climate as do the Noisette roses.

SOIL AND PLANTING

Climbing roses should be planted in good-sized holes filled with good garden soil mixed with rotted manure. The body of good soil available for a climbing rose should be enough to fill a hole 3 feet square and 30 inches deep. If the roots can spread indefinitely, a good soil 10 inches deep may be satisfactory. The drainage must be good, as already stated, and the planting must be carefully done. The roses should not be planted closer than 6 feet apart.

PRUNING

The Wichuraiana and hardy climbing roses should be pruned just after they have bloomed. At this time young shoots will have started from the roots. The growth of these shoots should be encouraged because from them are produced the branches that bear the following year's bloom. The best way is to remove all old wood at this time, so that all the strength will go into the young shoots. Where the roses are trained over a trellis so high that one season's growth will not cover it, the method of pruning just described is not practicable. In such cases some of the old shoots should be cut off at the ground, and an equal number of new ones should be permitted to replace them. The others should be shortened to where there are new side shoots starting at a proper height to recover the support. A few vigorous branches are more desirable than a large number of weak ones.

In the spring any weak branches may be removed, and the ends of some of the others may be shortened, but comparatively little should be taken off. Figure 9 shows climbing roses after the spring pruning. The left-hand panel of Figure 10 shows the same roses in bloom, while Figure 11 shows the same plants six weeks after blooming, all the wood shown in Figure 9 having been cut away as soon as the blooms faded. The wood seen in Figure 11 is of the current season's growth. Blooms on the Multiflora and Wichuraiana roses and their hybrids will be on shoots from last year's wood, and every bud removed reduces the number of blooms. This method of pruning removes most of the foliage just after blooming and leaves the trellises without covering during the hottest part of the summer.

A climbing hybrid Noisette such as the Maréchal Niel should be trained to one good strong cane with the side shoots cut back to about three eyes. The main cane can be renewed occasionally. The Cherokee rose should be treated like the border roses, only dying or crossing branches being pruned. Every few years it may be cut back severely and allowed to start again.

Climbing hybrid tea roses bloom more or less constantly throughout the season and bear their flowers on growth of the current year growing from wood of any age. Therefore it is not necessary to guard growths of the previous season in order to have flowers, but it is necessary to thin out much of the weakest wood, leaving only those growths located most suitably for the decorative effect desired.

PROTECTION

In the northern sections where roses are likely to winterkill it is necessary to protect climbing roses. Wrapping the bushes in straw is effective if the cold is not too great, but is somewhat unsightly.

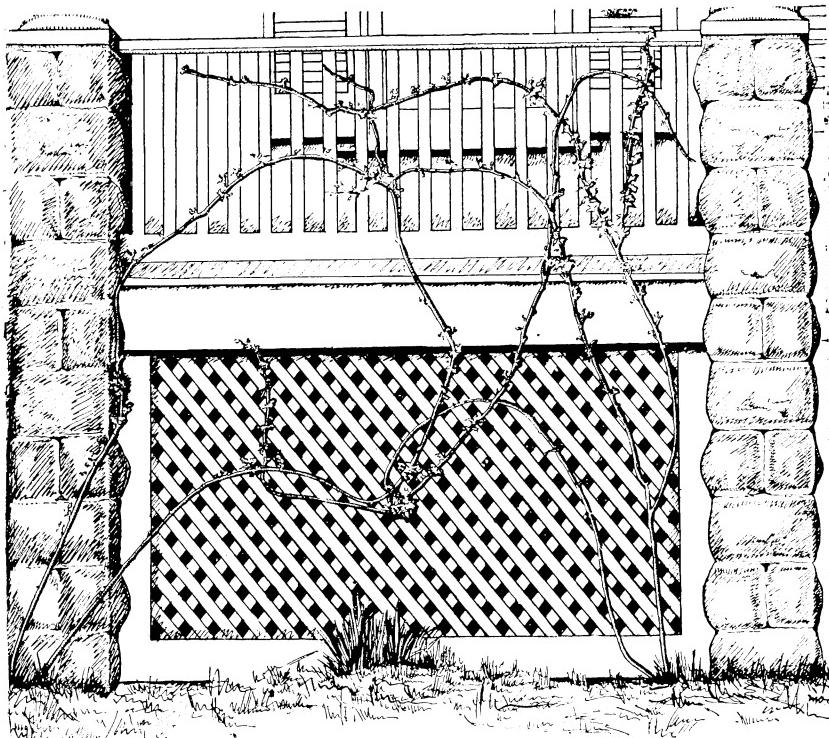


FIGURE 9.—Climbing (Dorothy Perkins) roses after spring pruning

It permits keeping the vines nearly in their summer positions. A surer method is to lay the vines down, cover them with earth, and after the earth is frozen add a layer of straw or manure. This covering must be removed in the spring as soon as freezing is over. Trellises or supports hinged near the ground so that they can be laid down in winter facilitate this protection.

SPRAYING, CULTIVATION, AND PROPAGATION

Special care is required in spraying climbing roses, since they are susceptible to insect and disease attack and are usually planted in conspicuous positions where slight imperfections are particularly

visible. They often seem more subject to disease when planted next to buildings than when planted in more open locations. This may be because of restricted air circulation or to the injurious effects of



FIGURE 10.—Dorothy Perkins roses in bloom. The left-hand panel shows the same bushes illustrated in Figure 9, as they appeared later

reflection of light and heat from the buildings. Many of the spraying materials used on roses are injurious to the surfaces of buildings, so care should be exercised in their use.

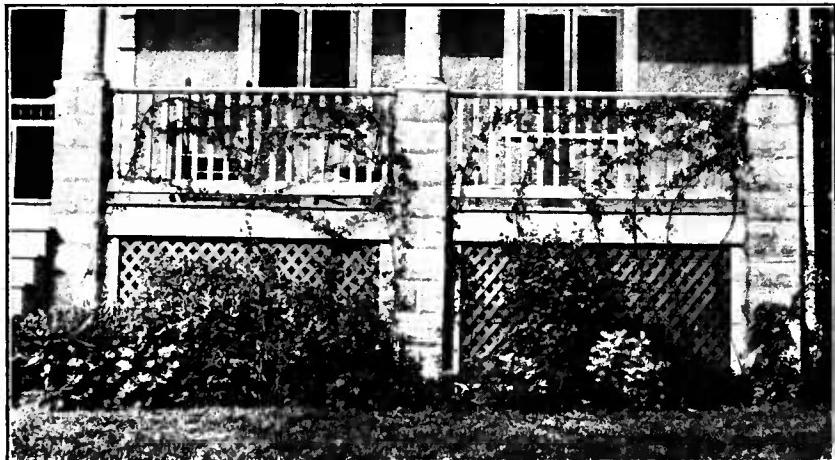


FIGURE 11.—The same roses shown in Figures 9 and 10 after the blooming season. All the bent stems seen in Figure 9 and all the flowering wood seen in Figure 10 have been removed, and what is shown here is the young growth made during the current season

The area occupied by the roots of climbing roses should be kept free from weeds, and they should be fed liberally each year.

These roses are usually propagated from hardwood or greenwood cuttings or by budding on stocks of some form of *Rosa multiflora*, including plants of the named varieties grown from cuttings. Home gardeners often grow these roses under jars as has been described.

ROSES FOR CUT FLOWERS

Roses that are especially grown for cut flowers require special attention and care to be successful. Their appropriate place is in the flower garden or in a secluded bed of their own, as shown in Figure 12. They need more room and more cultivation than plants adapted to border planting. For ease of cultivation, for accessi-

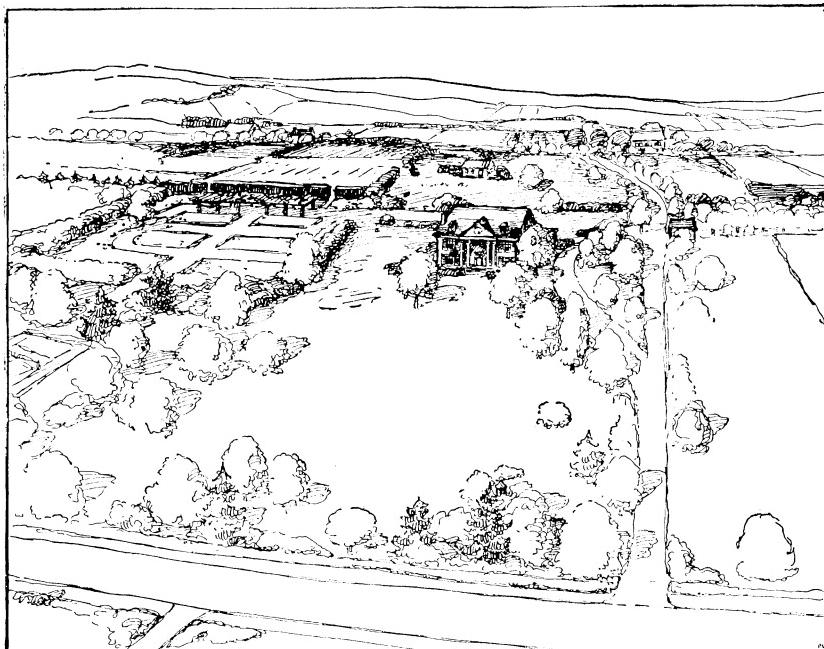


FIGURE 12.—Farm home grounds, showing possible location for roses. Border roses would be appropriate with other shrubs in any of the clumps indicated, either near the house or along the borders of the lawns. Cut-flower roses would be appropriate either in their own beds in the flower garden or in the cut-flower garden.

bility in gathering blooms, for effectiveness in treating insect and fungus attacks, and to reduce root competition, it is desirable that these roses be grouped in beds specially arranged for them. Like other flowers designed primarily to be cut, they have an important place on the home lot, but that place is in a special garden or in a subordinate location in the general planting scheme, and they should not be used for lawn planting.

DESIRABLE VARIETIES

Hybrid perpetuals, hybrid teas, teas, Bourbons, and Chinas or Bengals, are especially suitable for producing cut flowers. There is a multitude of varieties, so that everyone should be able to find some to his liking.

The hybrid perpetual roses (fig. 13) usually bloom only in the early summer, but sometimes bloom a second time if thoroughly pruned, especially if given a midsummer check by dry weather. They are the hardiest of the cut-flower roses and the only ones to be relied upon in the colder parts of the country and in the rural districts of the dry-land region. The map (fig. 14) indicates the region where these roses are most useful. In warmer sections with plenty of moisture the hybrid teas are more desirable.

The hybrid tea roses (fig. 15), when properly treated, bloom from spring until cold weather. Many of the varieties succeed north of the area marked for them. They will succeed on the southern portions of the Great Plains if irrigated, but are not adapted to unirrigated sections of that region.

Tea roses are more tender than hybrid teas. Although some of them are weak growers, they are most attractive. One writer describes them as "the spoiled child of the rose family." They succeed

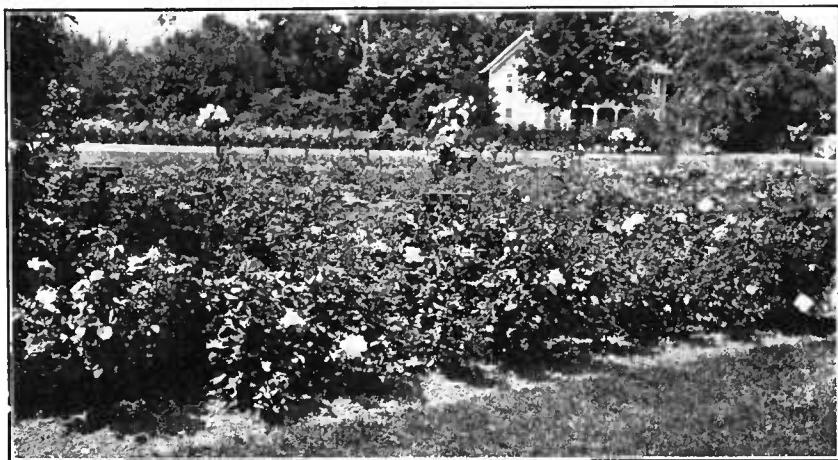


FIGURE 13.—A bed of hybrid perpetual roses (*Frau Karl Druschki*)

well in the South Atlantic and Gulf States and on the Pacific coast. These and the hybrid teas are the most satisfactory roses in the regions where they succeed.

The China or Bengal rose is one of the forms from which a great many of the garden roses have been developed. But few of these varieties are now offered by nurserymen.

The Bourbon rose is best known through the variety *Souvenir de la Malmaison*, which in hardiness compares favorably with the hybrid teas.

The Pernetiana roses are a comparatively new group produced by an admixture of China roses with some of the hybrid teas. They are probably more subject to black spot, or at least to the loss of their leaves in hot weather in the warmer sections of the country, than are the better hybrid teas. There are literally hundreds of varieties of these roses (teas, hybrid teas, and Pernetiana) and large numbers are being introduced each year, but only about 1 in 10 is really satisfactory in any one locality. Near-by growers or nurserymen, fa-

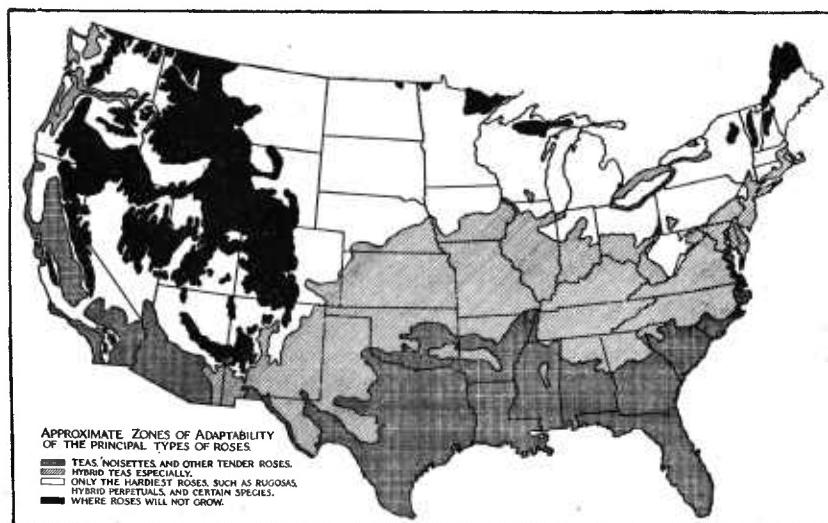


FIGURE 14.—Outline map of the United States, showing the classes of roses best adapted for cut-flower purposes in the different sections

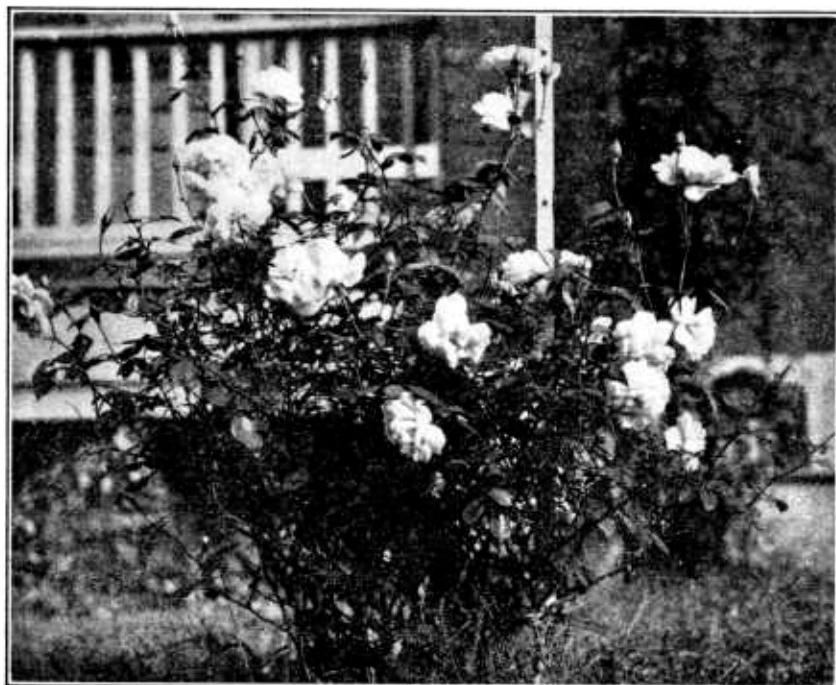


FIGURE 15.—A hybrid tea rose (White Maman Cochet)

miliar with local conditions, should be consulted before varieties are selected. The larger rose-growing firms can make reasonably safe suggestions for any locality if given full information on location, exposure, kind of soil, and other local factors.

SOILS

Most of these roses are successful on a wide range of soils, although they do best on soils with much clay. Hybrid tea roses thrive on lighter land than do the hybrid perpetals, and the tea roses will thrive on light sandy loam if it is well fertilized with suitable manures.

FERTILIZERS

Cut-flower roses especially need cow manure. It is so important that some greenhouse growers of these roses maintain their own dairies for the sake of the manure. Well-prepared compost and stockyard cattle manure are the best substitutes. Applications of liquid manure at intervals during the summer produce the best results. Cow manure stirred in water and allowed to soak for a few days and then diluted before being applied, is probably best. Substitutes are nitrate of soda or sulphate ammonia, dissolved at the rate of 1 ounce to 1 gallon of water. A pint of this solution is applied about each bush and the application is followed immediately by a good watering. A pint of this solution can be added to 3 gallons of water and applied in this way. Such stimulation should be repeated monthly from the time the first roses open until 10 weeks before freezing weather is expected.

PLANTING

In recent years growers of cut-flower roses have been divided into two strongly partisan groups, one contending that own-root roses grow nearly as freely as do grafted roses and are free from the danger of being starved by sprouts from the stock, the other group asserting that grafted or budded roses are more vigorous and that a little attention would keep the sprouting of the stock in check. Recent investigations seem to indicate that, as a rule, the grafted and budded roses grow a little more vigorously, at least during the first few years, and that there is little trouble with the sprouting of stocks now used.

Budded roses, as usually sold, have a 1-year-old head on either 1-year-old or 2-year-old stocks. Such plants are large enough to produce good results the first season after they are planted. Plants a year older, or extra heavy, can usually be obtained. Own-root hybrid perpetals, hybrid teas, and teas are offered by nurserymen as 1-year-old, 2-year-old, or sometimes as 3-year-old plants. Plants 1 year old are sold from small pots, to be planted with the ball of soil. These plants are small, and require careful nursing the first year after they are planted. Own-root plants 2 years old, although usually smaller than budded plants with 1-year-old heads, may be expected to produce a good display of flowers the first season after they are planted.

Hybrid perpetual roses should be set from 2 to 3 feet apart, depending on the vigor of growth and the locality. In the regions

indicated on the map (fig. 14) as having to depend mostly on these roses for cut flowers, 30 inches is probably far enough apart when the roses are pruned for individual blossoms. When the greatest mass of bloom is wanted, the vigorous ones had better be 3 feet apart. In the South they should be slightly farther apart; but because most of them bloom only once during the season, or at most only in the spring and fall, such roses are neglected there in favor of kinds more desirable for the region.

Tea roses should be planted from 18 to 30 inches apart, depending on the vigor of growth and the proposed treatment, 18 to 24 inches probably being about right for cut flowers.

The hybrid tea roses have even a greater range of character of growth than the other kinds discussed, and the proper distance for planting is correspondingly variable, ranging from 20 inches to 3 feet, and being greatest in the warmer regions where the roses get an abundance of water and smallest where they are retarded in growth by cold winters or dry summers.

The China and Bourbon roses should be planted about as far apart as the hybrid perpetuals, and the Pernetianas as the hybrid teas.

Dormant cut-flower roses, when set, should be cut back severely, leaving only two or three stems with four or five eyes on each. This will leave them 6 inches or less in length.

If the planting is done in the fall, in regions where there is freezing weather or severely drying winds, earth should be mounded about the plant (fig. 3), to protect it during the winter; in the spring the earth should be leveled down so that the plant is covered to a normal depth.

Potted roses should require no pruning.

PRUNING

To obtain individual blossoms of greatest perfection, as well as to secure a succession of bloom, severe pruning is necessary. When a large number of blooms, even though of smaller size, is the aim, the pruning is less severe. Where the greatest amount of bloom is desired, without regard to the size or quality of the individual flowers, the least pruning is done.

Pruning should be done as soon as freezing weather is over. In regions where roses never suffer from cold it may be done in the fall. All weak wood and crossing branches should be removed every year. For fine specimen blooms on hybrid perpetuals the remaining shoots should be shortened to four or five eyes. Figure 16 shows unpruned hybrid perpetuals and Figure 17 the same bushes pruned for individual blooms. For the greatest mass of bloom only one-third to one-half the length of the shoots should be cut away.

In regions where cold sometimes injures roses, teas and their hybrids should be trimmed later than the other classes, or as growth starts. They should be trimmed in the same manner as the hybrid perpetuals, but because their growth is usually more delicate they will look much smaller when the work is done. The strongest-growing roses should not be cut so short as the weaker ones. When overpruned the tendency of the plants is to grow rather than to

bloom, and a few varieties will not stand the extremely close pruning described. When pruned for specimen blooms the teas and

hybrid teas will be only 6 inches to 1 foot high. Figure 18 shows an unpruned hybrid tea, while Figure 19 shows the same bush pruned for individual blooms. China and moss roses should be treated the same as the teas and hybrid teas, except that it is not desirable to cut them quite so closely. Bourbon roses should have only half the length of the shoots removed. Summer pruning is desirable.

When a flower is cut from a tea rose or other perpetual bloomer, only two or three strong eyes of the current season's growth of that

FIGURE 16.—Unpruned hybrid perpetual roses: *Gloire de l'Exposition de Bruxelles* (at right) and *Frau Karl Druschki* (at left)

branch should be left on the plant. This should give the roses very long stems. Figure 20 is the same plant shown in Figure 19 as it appeared the next June. It will seem like destroying the bush to take off so much, but if the object is the production of roses, cutting away the surplus wood will attain the desired end. If the spring pruning has not been sufficiently severe, the plant is likely to have the characteristics shown in Figure 21, long, naked stalks and short stems to the flowers. With this character of growth only one strong leaf bud should be left on the branch when the flower is cut, in order to stimulate as much growth as possible from the base of the plant.

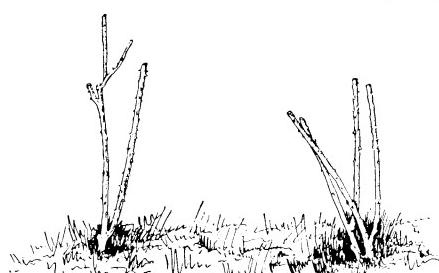


FIGURE 17.—Hybrid perpetual roses pruned for individual blooms. These are the same bushes shown in Figure 16.

The greatest temptation to leave wood is where there are two or more buds on one branch, some being small when the terminal bud is open. This temptation to follow a bad practice can be avoided by pinching off all side shoots after a bud has formed on the end of a branch. This prevents the formation of two or more buds on one stalk. Such summer pruning will encourage additional blooms on varieties which bloom more than once a year.

Where winter protection is necessary it is desirable to cut back the tops in the fall to within 30 inches or less of the ground, so the bushes may be covered more easily. This should be followed in the spring by the regular pruning. The long stems left in this fall pruning help to hold the winter mulch from blowing away and from packing too closely. They are also long enough to allow considerable winterkilling and yet have sufficient eyes left to insure ample growth for the next season's bloom.



FIGURE 18.—Hybrid tea rose (Radiance) before pruning

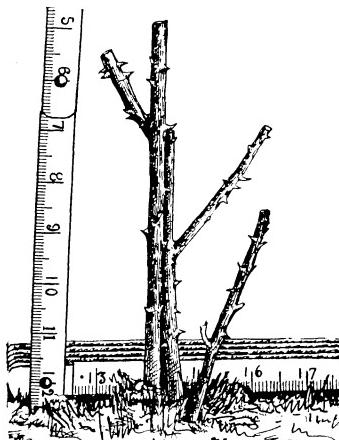


FIGURE 19.—A hybrid tea rose (Radiance) after pruning for individual blooms. This is the same bush shown in Figure 18

PROTECTION

Cut-flower roses need winter protection in the northern half of the country. This is best provided by banking earth up about the plants to a height of a foot or more, especially if the mound is covered well with manure after the ground freezes. Coarse manure, straw, or leaves may be applied after the banking already described.

Evergreen boughs, or even branches from deciduous plants, are often helpful in holding the other materials in place, besides being a protection in themselves. Individual specimens are often wrapped in straw or straw and burlap. The mulching materials are sometimes used without banking the plants, but there is danger of trouble from mice if straw or strawy manure is used, especially during hard winters. This danger is minimized by banking earth about the plants before mulching. The earth cover must be promptly removed in early spring, as soon as danger of freezing is past.

Cut-flower roses thrive best when not exposed to strong winds, even in summer. For that reason it is desirable that they be protected. Shrubbery borders, evergreen plantations, and sometimes even fences covered by roses or other vines will make satisfactory windbreaks.



FIGURE 20.—The same rose shown in Figures 18 and 19 as seen at blooming time. Two blooms were cut from this bush three days before the picture was taken. The remaining blooms should be cut under the foliage, near the ground, where the stems are hidden.

ically handled in rows sufficiently far apart for horse cultivation. Cultivation should begin early and continue till within six weeks of the dormant season.

At the first cultivation in spring the manure of the winter mulch should be worked into the soil, or a good coating of manure should be applied if there is no mulch. The first working should be deep, to incorporate the manure with the soil. Later cultivations should be gradually shallower until just deep enough to maintain a surface mulch.

Where, because of mild weather, roses have only a short winter check, and are grown under irrigation part of the year, it is conducive to better results to check their growth in the dry season for a month or six weeks by drying them and forcing them to rest.

CULTIVATION

Cut-flower roses should have the ground entirely to themselves. They should not be planted among other plants nor have other plants between them, not even pansies or other low-growing herbs. They need clean cultivation throughout the season every year. If room permits, and if a large number of roses are being grown, they can be more econom-

Where growth is not satisfactory and some plants do not seem to take hold so well as others, the application of a diluted liquid manure often stimulates a plant and starts it to growing well.

SPRAYING

Cut-flower roses appear to be especially susceptible to insect and disease attack and lack of perfection is especially noticeable as flowers and foliage are brought into the house where every defect is subject to close scrutiny. For these reasons careful and persistent spraying or dusting is important. It should begin with the dormant sprays and continue well into the fall.

PROPAGATION

Cut-flower roses are chiefly grown from greenwood cuttings and by budding and grafting on forms of *Rosa multiflora*, *R. manetti*, and Gloire des Rosomanes (*Ragged Robin*), although *R. rugosa* and other stocks are used and it may be found that stocks little used at present may be better suited to special conditions, as in the South or on soils tending toward alkali, than stocks now being used. Home gardeners often grow these roses under jars, as previously described, and there is no reason why more amateur gardeners should not learn to bud roses for their own gardens.



FIGURE 21.—A hybrid tea rose (Killarney) on which the stems were left too long in pruning

ROSES FOR OTHER ORNAMENTAL PURPOSES

BEDDING

It is often desirable to plant roses in beds or masses to obtain the decorative effect of bloom during a long season. Where it is practicable to cultivate the roses regularly and to spray thoroughly and often, success may be achieved.

SPECIES AND VARIETIES

There are a few kinds of roses that are well adapted to bedding but these kinds include a large number of varieties.

Dwarf Polyantha rose.—The Baby Rambler (*Rosa polyantha*) roses comprise a group which includes a large number of varieties having dwarf habit (1 to 2 feet mostly), with many shades of white, pink, and red, the flowers borne freely in clusters throughout the season. They are very useful for low bedding.

Several of the roses described as suitable for cut flowers are also excellent for bedding. These include many of the hardier, free-blooming hybrid teas and the Chinas.

Many of the bush Noisette roses are also excellent, as are also the Rugosa roses and their hybrids.

They should be planted about 2 feet apart, fed liberally, and pruned moderately but regularly. If the hips could be clipped as the flowers fall it would be beneficial, but often this is not practicable. When planted in large beds it is sometimes better to set the larger-growing kinds 30 inches apart.

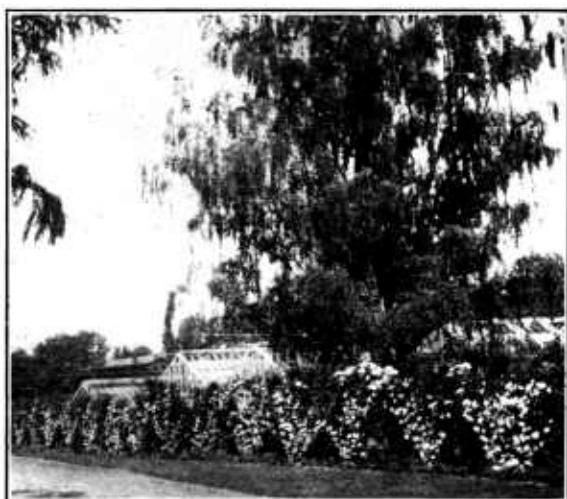


FIGURE 22.—A fence covered with climbing roses (Tau-sendschön and Philadelphia Rambler in alternation). The most pleasing effect is usually obtained by using a single variety of rose for decoration of this sort

brier roses make a good hedge if severely and frequently pruned, but most roses are neither sufficiently compact nor sufficiently branched to make a really good hedge. The Rugosa rose (fig. 23) makes a handsome summer barrier, but is so poorly branched that even in summer it does not give protection against small animals, and in winter it does not have a hedgelike appearance. It may be found that some of the untried rose species will be valuable for this purpose.

Hedges need to be closely pruned. This is probably best done twice a year, in the winter or spring and again after flowering time, pruning severely for outline and compactness.

Most so-called rose hedges are rows of cut-flower roses, usually pruned for masses of flowers, with little of the appearance of a hedge except when they are at the height of bloom. Where a few weeks' appearance of barriers is all that is needed, hybrid perpetual and hybrid tea roses as well as other species may be used for this purpose.

The hedge should be planted in a trench 3 feet wide and 2 feet deep, filled with good, well-enriched soil.

HEDGES

Roses are sometimes desired as a hedge, but they are not so well adapted to this purpose as are many other plants. Climbing roses make an excellent cover for a fence, as shown in Figure 22. The

GROUND COVERS

As already stated, *Rosa lucida* can be used for covering poor banks with foliage to a depth of 2 or 3 feet, and *R. nitida* grows to

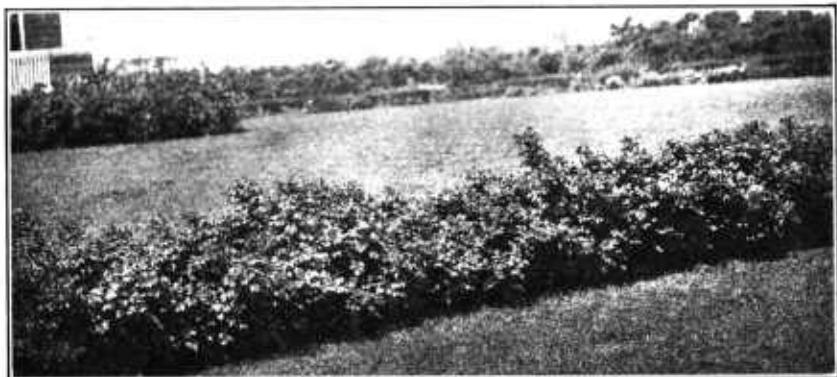


FIGURE 23.—A hedge of Rugosa roses

a height of only 18 inches. The *Wichuraiana*, already mentioned as a climbing rose, is a trailing rose when given an opportunity, and makes a beautiful, almost evergreen, ground cover (fig. 24) with small, glossy, dark-green leaves. It is useful for covering banks, planting along the sides of steps (fig. 25), or for hanging over rock



FIGURE 24.—Wichuraiana roses used as a ground cover in a parking space

cliffs or retaining walls. When permitted to trail it mats closely and roots at every joint. Some training but little pruning is needed when it is used in this way.

TREE ROSES

A tree rose (fig. 26) is a bush rose grafted 3 feet or more above the ground on a long, straight stalk of a brier, Rugosa, or other

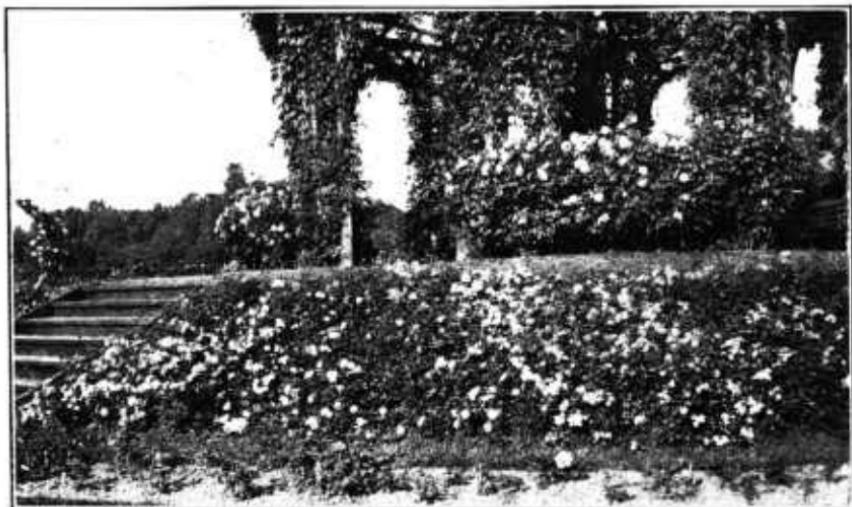


FIGURE 25.—A bank covered by *Wichuraiana (Memorial)* roses, with *Rugosa* roses against the summerhouse in the background

strong-stemmed rose. These bushes are not very satisfactory in most parts of the United States, because the stocks now available do not seem able to withstand the hot sun and hot drying winds of

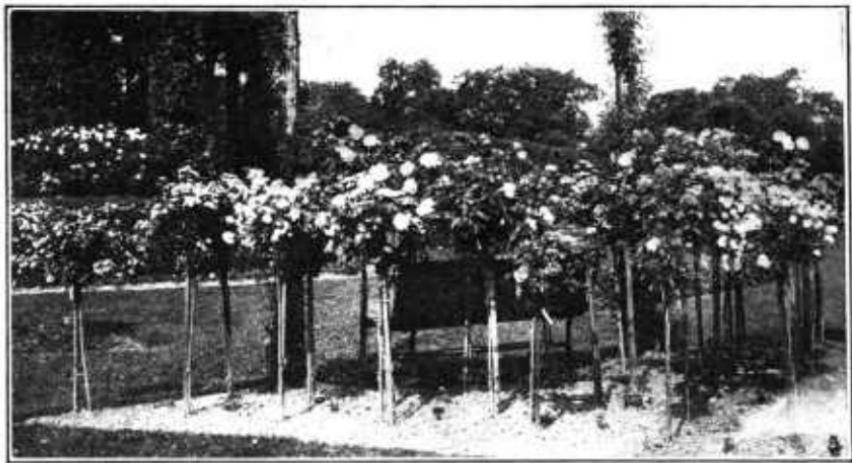


FIGURE 26.—Tree roses at Hartford, Conn. They are not very satisfactory in the climate of most of the United States

the climate. In western Oregon and western Washington they succeed. Their appropriate use is only in connection with a formal design, either in special gardens or near buildings.

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